



## ABSTRACT

### Summary

The present invention relates to a file management method of a recorded digital data stream. The present method checks whether or not a file structure formed in the rewritable disk is normal, renames an abnormal directory if the file structure is not normal, creates a normal file directory and a normal file, and writes input data stream in the created file under the created normal directory. In detail, this method provides a user with a message indicating that later reproduction of a rewritable disk, whose file name or directory of a real-time data file has been changed through a PC, would fail after the requested record is done, and creates new directory whose name conforms to standard file scheme, and writes input data stream as a real-time data file under the created standard directory. Consequently, the present invention prevents in advance file name or directory changed effects that would make it impossible to record data and to reproduce real-time data files.

### Key Figure

Figure 4

### Key Words

filename change, file structure, directory change, PC, warning message

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## SPECIFICATION

### Title

FILE MANAGING METHOD FOR A RECORDED DIGITAL DATA STREAM

### Brief Description Of The Drawings

FIG. 1 shows partial elements of an optical disk device such as a video disk recorder;

FIG. 2 is an example of a fixed file system for a rewritable disk;

FIGS. 3A and 3B show a format of file identifier

descriptor and its attribute fields, respectively;

FIG. 4 is a flow diagram of a file management method for a recorded digital stream according to the present invention;

FIGS. 5A and 5B are a file structure changed by a user and an example of a pop-up window showing the message indicative of wrong file structure;

FIG. 6 is an example of file structure managed in accordance with the present invention; and

FIG. 7 is an example of a message window provided when reproduction can not be conducted.

#### Major Elements In Drawings

1 : optical disk

2 : optical pickup

3 : VDR unit

4 : encoder

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#### Background Of The Invention

The present invention relates to a file management method of preventing in advance file name or directory changed effects that would make it impossible to record data and to reproduce real-time data files which are recorded in a disk recording medium such as a rewritable digital versatile disk (DVD-RAM, DVD-RW, etc.).

FIG. 1 shows partial elements of an optical device such as a video disk recorder which recording and reproducing a signal to/from a disk recording medium such as a rewritable DVD. The device configured as FIG. 1 comprises an optical pickup 2 reading a signal recorded in a rewritable DVD 1 or writing a data stream processed into a writable signal in the rewritable DVD 1; a VDR unit 3 processing the read signal to restore to original data and converting an inputted data stream into a signal adequate to be written; and an encoder 4 encoding a received analog signal into a data stream which is sent to the VDR (Video Disk Recording) unit 3.

Disk file management method conducted by the optical device connected with a personal computer (PC) through a digital interface is explained referring to the accompanying drawings.

5        Various types of data files are recorded in the rewritable DVD 1 and the data files consist of data stream files and information files. The data stream files contain text data or real time audio and video (A/V) data of large size and the information files contain control information such as  
10 navigation data for the A/V or text data contained in the data stream files.

To manage recorded files, a rewritable DVD may adopt a fixed file system, which is composed of a root directory, an A/V directory pre-defined as 'DVD\_RTAV' under the root, and  
15 data files having different pre-defined names and type-dependent extension names under the pre-defined A/V directory.

FIG. 2 shows an example of such a fixed file system in which an A/V directory 'DVD\_RTAV' under a root directory has  
20 several data files, each having pre-defined file name. Under the directory 'DVD\_RTAV', four files of 'VR\_MANAGER.IFO', 'VR\_MOVIE.VRO', 'VR\_STILL.VRO', and 'VR\_AUDIO.VRO' are recorded. The file 'VR\_MANAGER.IFO' contains navigation information for real-time data stream written in the other  
25 'VRO' files, the file 'VR\_MOVIE.VRO' contains data stream of moving pictures, the file 'VR\_STILL.VRO' contains data of still pictures, and the file 'VR\_AUDIO.VRO' contains audio data stream.

Detailed information for each of the above files  
30 structured as explained above is written in a file identifier descriptor (FID) whose fields are shown in FIG. 3A. These fields are 'Descriptor Tag', 'File Version Number', 'File Characteristics', 'Length of File Identifier', 'Information

Control Block (ICB)', 'Length of Implementation Use',  
'Implementation Use', 'Name of File Identifier', and padding.  
Among these fields, 'Name of File Identifier' field is used for  
writing a string indicative of a file name, 'Length of File  
5 Identifier' field is used for writing size information of the  
file name, and 'File Characteristics' field, whose size is 1  
byte, is used for writing various attributes of the file. The  
attributes written in 'File Characteristics' field are shown  
in FIG. 3B. The first LSB (Least Significant Bit) indicates  
10 whether an associated file exists or not, the second LSB  
indicates whether the file is directory or file, the third  
indicates deletion of the file, the fourth indicates whether  
the directory is parent or not, the fifth indicates meta data,  
and the remaining bits are reserved for future use.

15 If a title set recorded under a root directory in the  
rewritable DVD 1 is requested to be reproduced after the  
rewritable DVD 1 is inserted in the optical disk device of FIG.  
1, the VDR unit 3 searches the DVD 1 for video title set  
directory under the root directory, and tries to read the  
20 several files under the video title set directory. To read data  
files and their management file belonging to the video title  
set requested to be reproduced, the VDR unit 3 refers to  
information written in FID. The VDR unit 3 reads data files  
sequentially after searching them using navigation information  
25 written in the management file.

The disk device of FIG. 1 may be connected a personal  
computer (PC) through a digital interface, so that a user might  
request, through OS of the PC, file name of a file recorded in  
the rewritable DVD 1 to be changed into a desirable name through  
30 the PC and the digital interface. In addition, a user might move  
one or more files under a video title set directory to other  
directory.

However, the VDR unit 3 searches a rewritable DVD for

pre-specified file names under pre-specified directory, which satisfy the file structure shown in FIG. 2, according to a playback-requested video title set or A/V data stream, therefore, the VDR unit 3 could not determine which file to read  
5 if the file or directory names have been changed or files have been moved to other directories through a command from a connected PC to the disk device, so that it could not reproduce a playback-requested video title set.

Subject To Solve Through The Invention

10 It is an object of the present invention to provide a file management method that changes a directory including a real-time data file and creates normal real-time data file and its directory for writing input data, in case that the file name of real-time data file has been changed through a PC, in order  
15 to prevent in advance file name or directory changed effects that would make it impossible to record data and to reproduce real-time data files.

Explanation Of The Invention

A file management method according to the present  
20 invention is characterized in that it comprises the steps of: checking whether or not a file structure formed in the rewritable disk is normal; renaming an abnormal directory if the file structure is not normal; and creating a normal file directory and a normal file and writing input data stream in  
25 the created file under the created normal directory.

In order that the invention may be fully understood, preferred embodiments thereof will now be described with reference to the accompanying drawings.

FIG. 4 is a flow chart of a file management method of  
30 recorded digital data stream in accordance with the present invention. The flow of FIG. 4 is for the case that a rewritable recording medium, whose at least one file name or directory of a real-time data file has been changed through OS of a PC, is

inserted in the optical device of FIG. 1 and then additional input data is to be recorded onto the recording medium.

As depicted in FIG. 4, if a rewritable disk is inserted into the disk device of FIG. 1 (S10) and is requested to record 5 real-time A/V data stream (S11), the VDR unit 3 examines the file structure formed on the rewritable disk (S12) before recording input data stream. If the written files and directories conform to standard file system pre-defined for A/V data recording disk (S13), the VDR unit 3 records input data 10 stream in an appropriate file of the rewritable disk according to the attribute of input data stream (S14).

If not, for example, if pre-defined file 'VR\_MANAGER.IFO' has been renamed to '1234.IFO' with a PC as shown in FIG. 5A, the VDR unit 3 constructs a message indicating that later 15 reproduction of the rewritable disk would fail after the requested record is done and asking whether the recording request is still insisted nevertheless, and outputs the message to be displayed (S15).

If the requested record is cancelled from a user after 20 the message is displayed (S16), the VDR unit 3 terminates a record preparing operation, however, if data record is still demanded (S17), the VDR unit 3 renames the directory 'DVD\_RTAV' containing the file '1234.IFO' whose name is non-standard to non-standard directory name, for example, 'DVD\_RTAV1' (S18).

25 Then, the VDR unit 3 creates new directory whose name conforms to standard file scheme, that is, 'DVD\_RTAV', copies all files under the renamed directory 'DVD\_RTAV1' into the created standard directory 'DVD\_RTAV', and changes the wrong file name '1234.IFO' under the 'DVD\_RTAV' into 30 'VR\_MANAGER.IFO' to be conformed to standard file system.

After this correction, the VDR unit 3 writes input data stream in the file 'VR\_MOVIE.VRO', 'VR\_AUDIO.VRO', or 'VR\_STILL.VRO' (S19), and updates the navigation information

of the file 'VR\_MANAGER.IFO' to reflect changed information caused from the data recording.

Owing to the above recording operation, later recording or reproduction fail that might be caused from change of file name or directory of a real-time data file can be prevented in advance.

In the above file system checking procedure, if the pre-defined directory 'DVD\_RTAV' is not found or there is not a pre-defined file such as 'VR\_MANAGER.IFO' under the pre-defined real-time directory 'DVD\_RTAV', the VDR unit 3 constructs a message indicating that later reproduction of the rewritable disk would fail after a new data record, and outputs the message to be displayed. When a new data record is requested, the VDR unit 3 creates new directory whose name conforms to standard file scheme, and writes input data stream as a real-time data file under the created standard directory.

In the above file system checking procedure, it is also examined whether data recording information written in the file 'VR\_MANAGER.IFO' is in accordance with the recorded files under the directory 'DVD\_RTAV'.

For example, in case that three bit flags are defined in the file 'VR\_MANAGER.IFO' for each data stream file, if bit flags are all marked as '1' to indicate that all data stream files exist, however, either of the data files 'VR\_MOVIE.VRO', 'VR\_AUDIO.VRO', and 'VR\_STILL.VRO' is not found, then the VDR unit 3 conducts correction operation explained above.

To correct such a fault, the VDR unit 3 renames the directory 'DVD\_RTAV' to an arbitrary non-standard name, creates the directory 'DVD\_RTAV', copies all files under the renamed directory into the created directory 'DVD\_RTAV', and corrects the discordance between information written in the file 'VR\_MANAGER.IFO' and the existing data files by creating or deleting a necessary data stream file to meet the information

written in the file 'VR\_MANAGER.IFO' or modifying an appropriate bit flag.

The file system checking procedure is also conducted when a disk playback is requested. If the file structure of a rewritable disk, whose file name or directory of a real-time data file has been changed, inserted to be played back is against standard file system, the VDR unit 3 outputs a message informing that disk reproduction is impossible and explaining the reason, e.g., wrong file name change of '1234.IFO' corresponding to 'VR\_MANAGER.IFO'. FIG. 7 is an example of a message window provided when there is no essential file 'VR\_MANAGER.IFO'.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

#### Effect Of The Invention

The file managing method for real-time data file according to the present invention provides a user with a message indicating that later reproduction of a rewritable disk, whose file name or directory of a real-time data file has been changed through a PC, would fail after the requested record is done, and creates new directory whose name conforms to standard file scheme, and writes input data stream as a real-time data file under the created standard directory. Consequently, the present invention prevents in advance file name or directory changed effects that would make it impossible to record data and to reproduce real-time data files.

**What is claimed is:**



1. A file managing method in recording data stream in a rewritable disk, comprising the steps of:

(a) checking whether or not a file structure formed in the rewritable disk is normal;

5 (b) renaming an abnormal directory if the file structure is not normal; and

(c) creating a normal file directory and a normal file and writing input data stream in the created file under the created normal directory.

10 2. The method set forth in claim 1, wherein said step (a) determines whether or not the file structure is normal base on whether the file structure conforms to a pre-specified standard file scheme.

3. The method set forth in claim 1, wherein said step (a) 15 determines that the file structure is abnormal if a directory pre-defined in the standard file system is not found.

4. The method set forth in claim 1, wherein said step (a) determines that the file structure is abnormal if a management information file for real-time data files is not found.

20 5. The method set forth in claim 1, wherein said step (a) determines that the file structure is abnormal if existence of real-time data files indicated by management information written in a management file for real-time data files is not matched with actually-recorded real-time data files.

25 6. The method set forth in claim 1, wherein said step (b) renames the abnormal directory to an arbitrary directory whose name is different from other files.

7. The method set forth in claim 1, wherein the created directory and file have their names that conforms to a 30 pre-specified standard file system.

8. The method set forth in claim 1, wherein said step (b) comprises the steps of:

outputting a message to warn that recording may be failed

if the file structure is not normal; and  
renaming the abnormal directory if the requested  
recording operation is demanded again.

FIG. 1

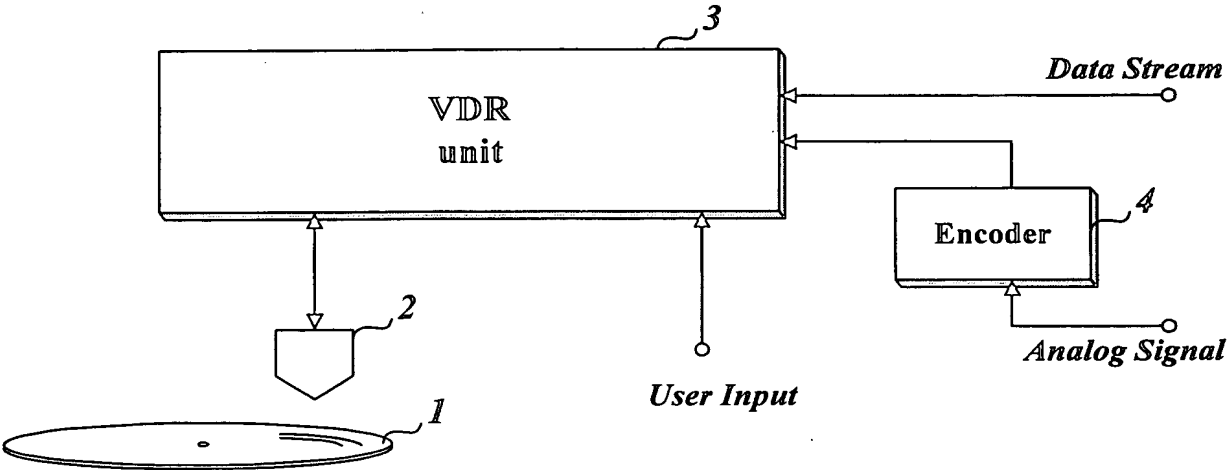


FIG. 2

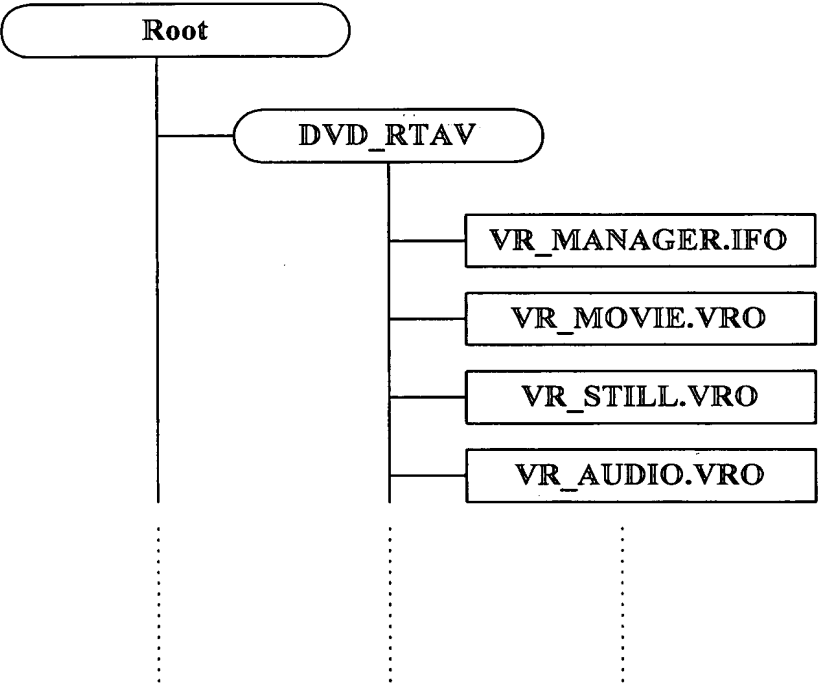


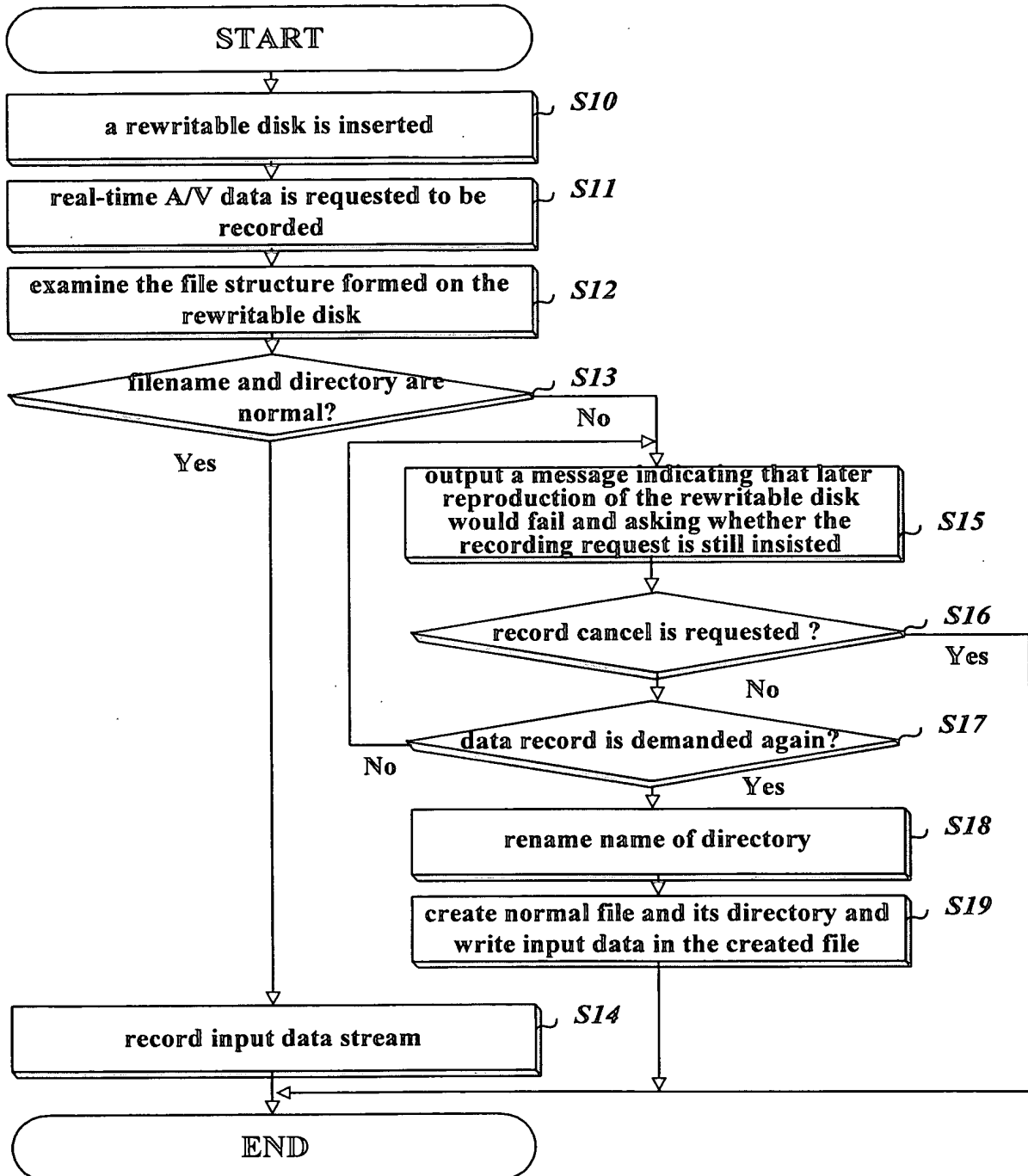
FIG. 3A

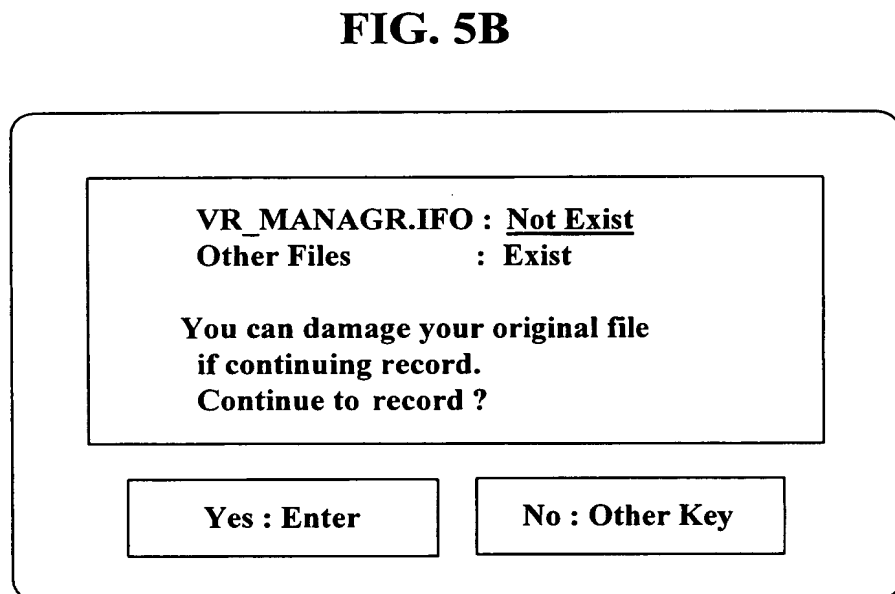
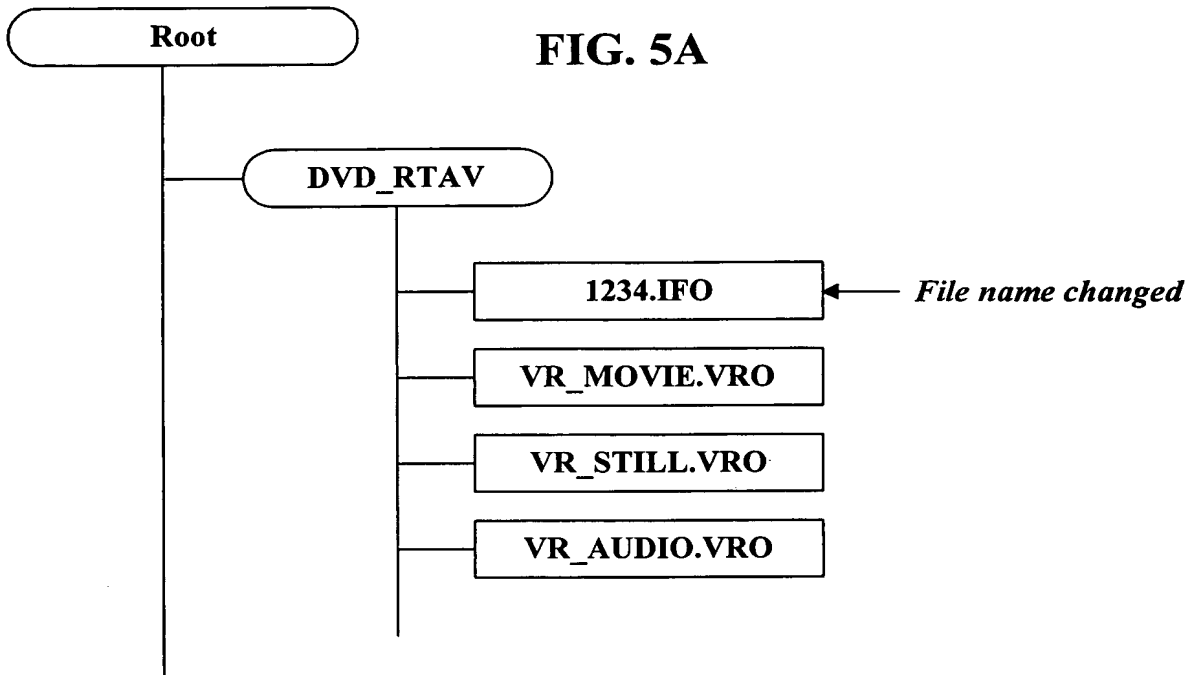
File Identifier Descriptor		
RBP	Length	Field Name
0	16	Descriptor Tag
16	2	File Version Number
18	1	File Characteristics
19	1	Length of File Identifier(= L_FI)
20	16	ICB (file entry address)
36	2	Length of Implementation Use(= L_IU)
38	L_IU	Implementation Use
a	L_FI	Name of File Identifier (= N_FI)
b	c	Padding

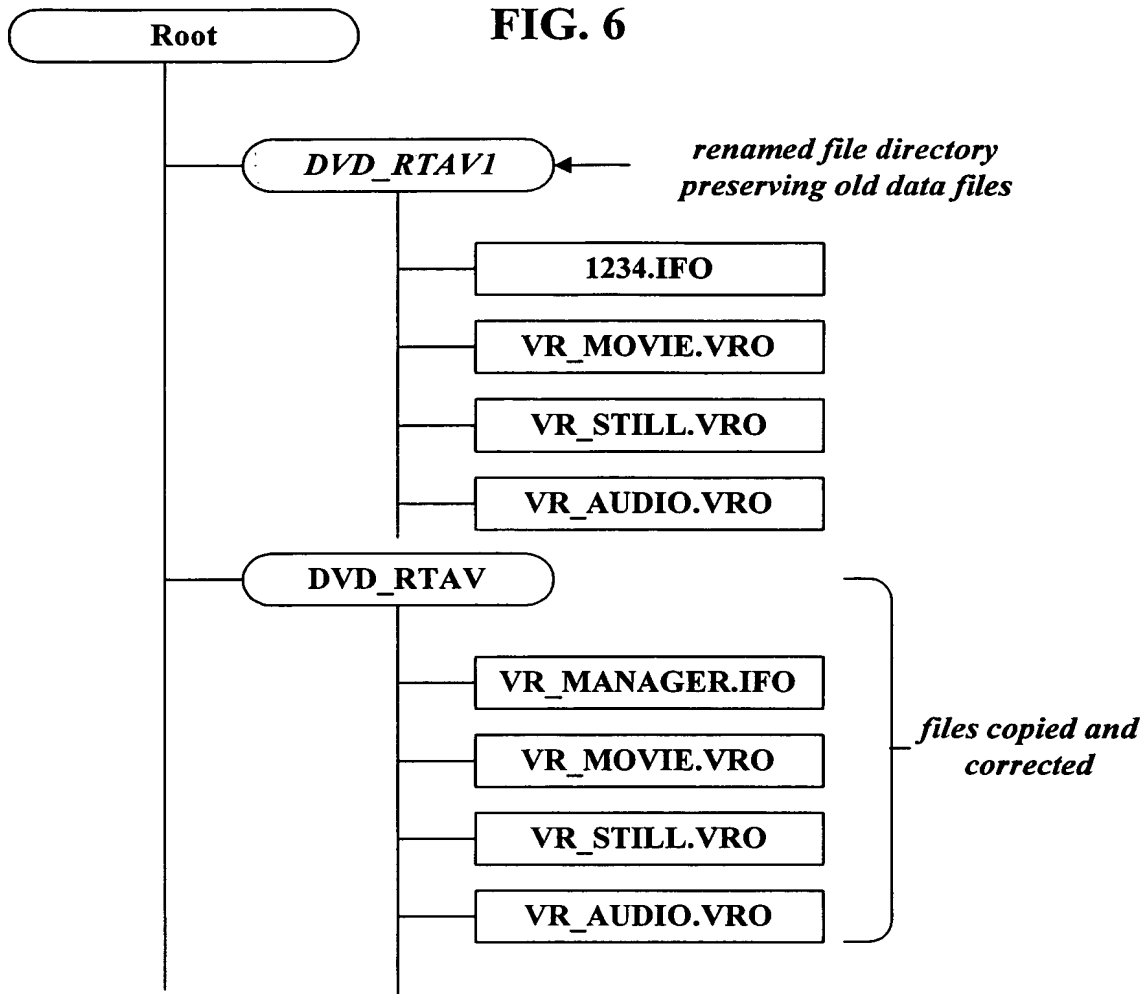
FIG. 3B

File Entry		
RBP	Length	Name
0	16	Descriptor Tag
16	20	ICB Tag
36	4	Uid
⋮	⋮	⋮
176	L_EA	Extended Attributes
[ L_EA+176 ]	L_AD	Allocation Descriptors

FIG. 4







**FIG. 7**

